

1 1. A method of modulating an immune response in a mammal, comprising:
2 identifying a mammal that has or is at risk for having a bladder disorder; and
3 administering an isolated nucleic acid comprising an unmethylated CpG sequence
4 to the mammal, to thereby modulate an immune response in the mammal.

1 2. The method of claim 1, wherein the nucleic acid is delivered to the bladder of
2 the mammal.

1 3. The method of claim 2, wherein the nucleic acid is delivered to the bladder by
2 instillation.

1 4. The method of claim 1, wherein the nucleic acid does not encode a naturally
2 occurring polypeptide.

1 5. The method of claim 1, wherein the nucleic acid is contained within a plasmid.

1 6. The method of claim 1, wherein the nucleic acid is delivered by microparticles.

1 7. The method of claim 6, wherein the microparticle comprises a synthetic
2 polymer.

1 8. The method of claim 8, wherein the microparticle comprises a synthetic
2 polymer.

1 9. The method of claim 1, wherein the mammal has a bladder disorder that is
2 characterized by inflammation.

1 10. The method of claim 9, wherein the inflammation is associated with
2 symptoms of interstitial cystitis.

1 11. The method of claim 9, wherein the inflammation is associated with a
2 disruption of the integrity of the bladder lining.

1 12. The method of claim 1, wherein a bacterial infection of the bladder of the
2 mammal is not detected at the time of the administration of the nucleic acid.

- 1 13. The method of claim 1, wherein the mammal has bladder cancer.
- 1 14. The method of claim 1, wherein the nucleic acid further comprises a sequence
2 encoding α -MSH.
- 1 15. The method of claim 1, further comprising administering a second isolated
2 nucleic acid to the mammal, wherein the second isolated nucleic acid encodes α -MSH.
- 1 16. The method of claim 1, wherein the mammal has a bladder disorder, and
2 wherein administering the isolated nucleic acid results in an amelioration of one or more
3 symptoms of the disorder.
- 1 17. The method of claim 16, wherein the bladder disorder is bladder cancer and
2 wherein administering the isolated nucleic acid results in a decrease in tumor size or
3 activity.
- 1 18. The method of claim 16, wherein the bladder disorder is interstitial cystitis
2 and wherein administering the isolated nucleic acid results in a modulation of the
3 immune response from a Th2 response to a Th1 response.
- 1 19. A method of modulating an immune response in a mammal, comprising:
2 identifying a mammal that has or is at risk for having a bladder disorder; and
3 administering an isolated nucleic acid comprising a sequence encoding α -MSH to
4 the mammal, to thereby modulate an immune response in the mammal.
- 1 20. The method of claim 19, wherein the nucleic acid is contained within a
2 plasmid.
- 1 21. The method of claim 19, wherein the nucleic acid is contained within a
2 microparticle.
- 1 22. The method of claim 21, wherein the microparticle comprises a synthetic
2 polymer.

1 23. The method of claim 19, wherein the nucleic acid is delivered by a
2 microparticle.

1 24. The method of claim 23, wherein the microparticle comprises a synthetic
2 polymer.

1 25. The method of claim 19, wherein the mammal has a bladder disorder that is
2 characterized by an inflammation of the bladder.

1 26. The method of claim 25, wherein the inflammation is associated with
2 symptoms of interstitial cystitis.

1 27. The method of claim 25, wherein the inflammation is associated with a
2 disruption of the integrity of the bladder lining.

1 28. The method of claim 19, wherein a bacterial infection of the bladder of the
2 mammal is not detected at the time of the administration of the nucleic acid.

1 29. The method of claim 19, wherein the mammal has bladder cancer.

1 30. An isolated nucleic acid comprising an unmethylated CpG sequence and a
2 sequence encoding α -MSH, wherein the unmethylated CpG sequence comprises an
3 immunostimulatory sequence.

1 31. A method of modulating an immune response in a mammal, comprising:
2 identifying a mammal that has or is at risk for having a bladder disorder; and
3 administering a peptide that binds to a melanocortin receptor to the mammal, to
4 thereby modulate an immune response in the mammal.

1 32. The method of claim 31, wherein the peptide is an α -MSH peptide.